

## PATENT SPECIFICATION

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## PROVISIONAL SPECIFICATION

## Improvements in Aircraft Arrestor Gear

We, BLACKBURN AIRCRAFT LIMITED, a British Company, of Brough, East Yorkshire, and ROBERT THARRATT, a British Subject, of "Haslemere", Wilson 5 Street, Anlaby, East Yorkshire, and WILLIAM HENRY THIRSK, a British Subject, of 5, Central Avenue, Beverley, Yorkshire, do hereby declare the nature of this invention to be as follows:—

10 This invention relates to aircraft arrestor gear such as is commonly employed to enable aircraft to alight on the deck of an aircraft carrier, or on some other fairly confined space where it is

15 necessary for the normal landing run to be shortened. Such gear is constituted by a hook member carried by the aircraft which on landing catches up in wires strung across the landing surface, and

20 the present invention is concerned with that part of the gear which is carried by the aircraft.

According to the present invention, the arrestor gear of the aircraft includes 25 a telescopic strut mounting an arrestor hook retractably in relation to the aircraft. Retraction and extension movements of the strut may involve swinging of the strut about an axis transverse to 30 the aircraft; while, again, the strut may be swingable angularly in use about an axis in the plane of the longitudinal axis of the aircraft, in which event there is preferably provision for some degree of 35 self-centering action tending to align the strut with the said longitudinal axis.

According to a preferred arrangement, the arresting gear consists chiefly of a hook arm which is mounted immediately 40 behind the tail wheel by means of a bracket fixed on the aircraft structure. Between the bracket and the arm is a trunnion which allows the arm to swing up and down about a retraction pivot and 45 to swing laterally about what may be termed a castoring pivot.

The lateral swinging is limited by means of fixed stops which are rubber-faced to prevent shock.

50 The hook arm is centralised by means of the spring-loaded plunger which has a roller engaging in a guide plate fixed on the castoring pivot.

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The hook arm comprises an outer tube of square section in which a circular 55 inner tube can slide freely. The inner tube has fixed at its rear end the hook to engage the deck landing wires, and at its forward end a square socket sliding freely in the outer tube. The square 60 socket prevents the inner tube and hook from rotating during extension and retraction. At the rear end of the hook arm and attached to the aircraft structure is a bifurcated guide bracket on 65 which is hinged a latch having a catch which engages a pin on the inner arm. The pin is engaged by the latch to hold up the hook arm in the stowed position. To the upper end of the latch is attached 70 a cable leading to the pilot's cockpit. The latch is spring-loaded into engagement with the pin and has an extension which presses down on the hook arm when the cable is pulled by the pilot. 75

At the forward end of the hook arm is an oil damper the cylinder of which is pivoted on the aircraft structure while the plunger is pivotally connected to the castoring pin. The damper allows the 80 hook arm to fall freely when released but is damped against sudden upward bumps when the hook is trailed along the aircraft carrier deck.

The oil damper cylinder is simply fed 85 with oil from a reservoir, and when the hook arm swings down on release oil is forced out of the damper cylinder back to the reservoir, oil running from the reservoir to the other side of the damper 90 piston through a relief valve, such as that described in the prior British Patent Specification No. 525,016.

When the pilot wishes to release the hook arm for deck landing, he pulls the 95 latch cable against its spring-loading, thereby releasing the latch from the catch pin on the hook arm. The latch extension then pushes down the hook arm until it is clear of the bifurcated bracket. 100 The hook arm then falls freely downwards except for the damping effect of the oil damper cylinder, and at the same time a compression spring housed inside the inner tube of the hook arm pushes the 105 inner tube outwards until the fully-

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extended position is reached.

The hook arm is then in a position to engage the arrester wires on the landing deck.

5 After the aircraft is arrested, the hook may be removed from the arresting wire and pushed home against the spring loading, whereafter it can be lifted until it engages the latch and is automatically 10 secured in the stowed position ready for flight.

It will be realised that due to the hook arm being both swingable and telescopic, it has a very effective range of extension 15 and can therefore be mounted behind the existing tail wheel of an aircraft; being so far back along the fuselage, there is far less tendency for the aircraft to tip over on the nose when the arrester gear 20 is being employed. Furthermore, the arrangement includes self-contained means for resisting lateral swinging of the hook arm and can therefore be housed

very conveniently in stowed form, lying truly fore and aft when stowed.

By reason of the fact that in the stowed condition the hook arm lies fore and aft, the whole can be enclosed in a faired casing, of which the part enclosing the hook arm can swing with the arm about 30 the retraction pivot. The fairing in the stowed condition of the hook arm may serve as a lower fixed fin at the tail of the aircraft and may considerably add to the anti-spinning characteristics of the 35 aircraft. The fin may be made with considerable inherent strength so that it can act as a skid during landing should the tail wheel be shot away or fail to come out from its retracted position.

Dated this 30th day of December, 1940.

For the Applicants:

F. J. CLEVELAND & COMPANY,

Chartered Patent Agents.

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Chancery Lane, London, W.C.2.

## COMPLETE SPECIFICATION

### Improvements in Aircraft Arrester Gear

We, BLACKBURN AIRCRAFT LIMITED, a British Company, of Brough, East Yorkshire, and ROBERT THREATT, a British Subject, of "Haslemere", Wilson 45 Street, Anlaby, East Yorkshire, and WILLIAM HENRY THIRSK, a British Subject, of 5, Central Avenue, Beverley, Yorkshire, do hereby declare the nature of this invention and in what manner the 50 same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to aircraft arrester gear such as is commonly employed to enable aircraft to alight on the deck of an aircraft carrier, or on some other fairly confined space where it is necessary for the normal landing run to be shortened. Such gear is constituted 55 by a hook member carried by the aircraft which on landing catches up in wires strung across the landing surface, and the present invention is concerned with that part of the gear which is 60 carried by the aircraft.

According to the present invention, the arrester gear of the aircraft comprises a pair of telescopic members one of which is pivoted rearwardly of the tail wheel 65 and is capable of swinging from stowed or retracted position to operative position as well as laterally; and the other of which has at its free end a hook.

Retraction and extension movements of 70 the arm involves swinging thereof about an axis transverse to the aircraft. In use the arm swings about an axis in the

plane of the longitudinal axis of the aircraft, in which event there is preferably provision for some degree of self-centering action tending to align the strut with the said longitudinal axis. It is further preferred that the movement of the arm about its operative pivot be damped such that it may freely swing into its operative position but reverse movement is throttled.

In order that the invention may be clearly understood and readily carried into effect, a preferred construction is 90 hereinafter more fully described by way of example with reference to the accompanying drawings which are given for purposes of illustration only and not of limitation.

In these drawings:—

Fig. 1 is a perspective view partly in section showing the arrester gear;

Fig. 2 is a detail view on an enlarged scale showing the pivot and centralising means;

Fig. 3 is a detail view also on an enlarged scale showing the latching means;

Fig. 4 is a side elevation of the tail of 105 an aeroplane showing the arrester gear in stowed position; and

Fig. 5 is similar to Fig. 4 showing the arrester gear extended ready for use.

Referring now to the said drawings, 110 and in particular to Fig. 1 thereof, the arresting gear consists chiefly of a hook arm which is mounted immediately behind the tail wheel (see Fig. 4) by

means of a bracket 2 fixed on the aircraft structure. Between the bracket 2 and the arm is a trunnion which allows the arm to swing up and down about a 5 retraction pivot 1 and to swing laterally about what may be termed a castoring pivot 3.

The lateral swinging is limited by means of fixed stops 6 which are rubber- 10 faced to prevent shock.

The hook arm is centralised by means of the spring-loaded plunger 7 which has a roller 8 engaging in a guide plate 9 fixed on the castoring pivot 3.

15 The hook arm comprises an outer tube 10 of square section in which a circular inner tube 11 can slide freely. Resilient means such as a rubber buffer 4 or spring may be interposed to limit the relative 20 movement of the inner tube 11 and the outer tube 10 and to serve as a shock absorber. The inner tube has fixed at its rear end the hook 12 to engage the deck landing wires, and at its forward end a 25 square member 30 sliding freely in the outer tube 10. The square member 30 prevents the inner tube 11 and hook 12 from rotating during extension and retraction and constitutes the part which 30 engages the buffer 4. At the rear end of the hook arm and attached to the aircraft structure is a bifurcated guide bracket 31 on which is hinged a latch 14 having a catch which engages a pin 15 on the 35 inner arm 11. The pin 15 is engaged by the latch 14 to hold up the hook arm in the stowed position. To the upper end of the latch 14 is attached a cable 16 leading to the pilot's cockpit. The latch 40 40 is spring-loaded into engagement with the pin 15 by a spring 33 arranged within the telescopic members 17 and has an extension 18 which presses down on the hook arm when the cable 16 is pulled by 45 the pilot to release the latch.

At the forward end of the hook arm is an oil damper 19 the cylinder of which is pivoted at 31 to a bracket 32 on the aircraft structure while the plunger 34 is 50 pivotally connected at 35 to the castoring pin 3. The damper 19 allows the hook arm to fall freely when released but damps it against sudden upward bumps when the hook is trailed along the aircraft carrier deck.

The oil damper cylinder is simply fed with oil from a reservoir 20, and when the hook arm swings down on release, oil is forced out of the damper cylinder back 60 to the reservoir, oil running from the reservoir to the other side of the damper piston through a relief valve 21, such as that described in the prior British Patent Specification No. 525,016.

65 When the pilot wishes to release the

hook arm for deck landing, he pulls the latch cable 16 against the loading of the spring 33, thereby releasing the latch 14 from the catch pin 15 on the hook arm. The latch extension 18 then pushes down 70 the hook arm until it is clear of the bifurcated bracket 31. The hook arm then falls freely downwards except for the damping effect of the oil damper cylinder, and at the same time a compression spring 36 housed inside the inner tube 11 of the hook arm pushes the inner tube outwards until the fully-extended position is reached.

The hook arm is then in a position to 80 engage the arrester wires on the landing deck. Shock caused by the hook 12 catching a wire is reduced when a shock absorber is provided as indicated above.

After the aircraft is arrested, the hook 85 12 may be removed from the arresting wire and pushed home against the spring loading, whereafter it can be lifted until it engages the latch and is automatically secured in the stowed position ready for 90 flight.

Considerable relative movement of the inner and outer members of the arm is not essential and in some cases need only be sufficient to provide a shock absorbing 95 action.

It will be realised that due to the hook arm being both swingable and telescopic, it has a very effective range of extension and can therefore be mounted 100 behind the existing tail wheel of an aircraft; being so far back along the fuselage, there is far less tendency for the aircraft to tip over on the nose when the arrester gear is being employed. Furthermore 105 105 the arrangement includes self-contained means for resisting lateral swinging of the hook arm and can therefore be housed very conveniently in stowed form, lying truly fore and aft when stowed.

By reason of the fact that in the stowed condition the hook arm lies fore and aft, the whole can be enclosed in a faired casing indicated by the chain lines 37 in Fig. 1 and shown fully in Figs. 4 and 5, 115 of which the part enclosing the hook arm can swing with the arm about its operative or retraction pivot. The fairing in the stowed condition of the hook arm may serve as a lower fixed fin at the tail of the 120 aircraft and may considerably add to the anti-spinning characteristics of the aircraft. The fairing may furthermore be made with considerable inherent strength so that it can act as a skid during landing should the tail wheel be shot away or fail to come out from its restricted 125 position if it is retractable.

Having now particularly described and ascertained the nature of our said inven- 130

tion and in what manner the same is to be performed, we declare that what we claim is:—

- 5 1. An arrester gear for aircraft comprising a pair of telescopic members, one of which is pivoted rearwardly of the tail wheel so as to be capable of swinging from stowed or retracted position to operative position as well as laterally, and the 10 other of which has at its free end a hook.
- 15 2. An arrester gear for aircraft as claimed in Claim 1 wherein the pivoted telescopic member is of square section and the other telescopic member has a 15 square member slidable in the outer member so preventing angular displacement of the hook which is carried thereby.
- 20 3. An arrester gear for aircraft as claimed in Claim 1 or Claim 2 wherein a spring tends to urge the telescopic members into their extended position.
- 25 4. An arrester gear for aircraft as claimed in any of the preceding claims wherein the relative movement between the telescopic members is limited by a rubber buffer or spring which acts as a 25 shock absorber.
5. An arrester gear for aircraft as

claimed in any of the preceding claims in which the swinging of the pivoted 30 member about its lateral pivot is damped by means of a spring-loaded centralising device.

6. An arrester gear for aircraft as claimed in any of the preceding claims 35 in which the swinging of the pivoted member about its lateral pivot is limited by stops having resilient faces.

7. An arrester gear for aircraft as claimed in any of the preceding claims 40 which is maintained in stowed or retracted position by a latch operable at will and having a portion adapted on operation of the latch to thrust the telescopic members towards their operative 45 position to ensure release thereof.

8. An arrester gear for aircraft substantially as hereinbefore described with reference to Figs. 1 to 3 of the accompanying drawings. 50

Dated this 30th day of December, 1941.

For the Applicants:

TONGUE & BIRKBECK,  
Bank Chambers,  
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Chartered Patent Agents,

546,288 COMPLETE SPECIFICATION

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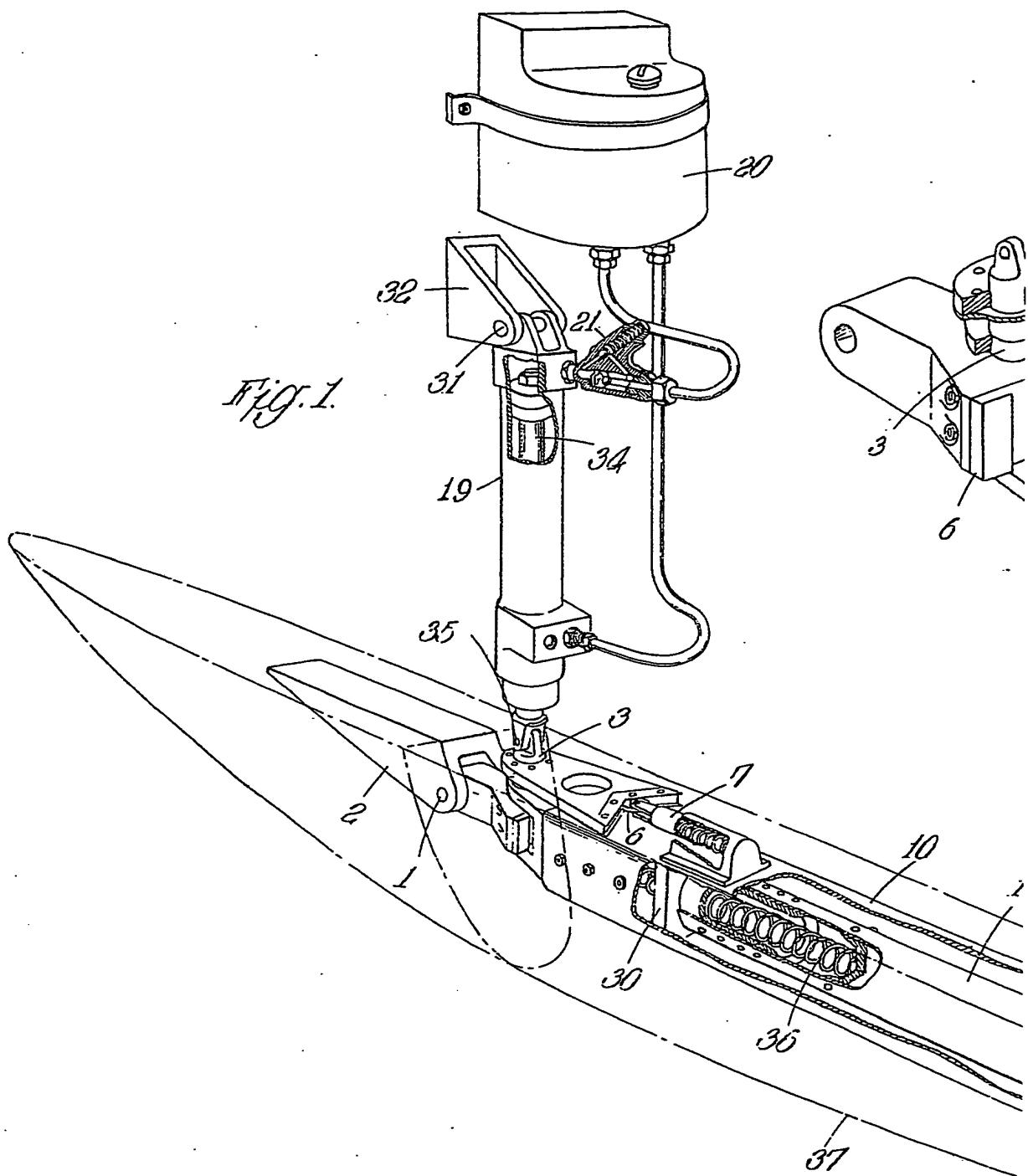
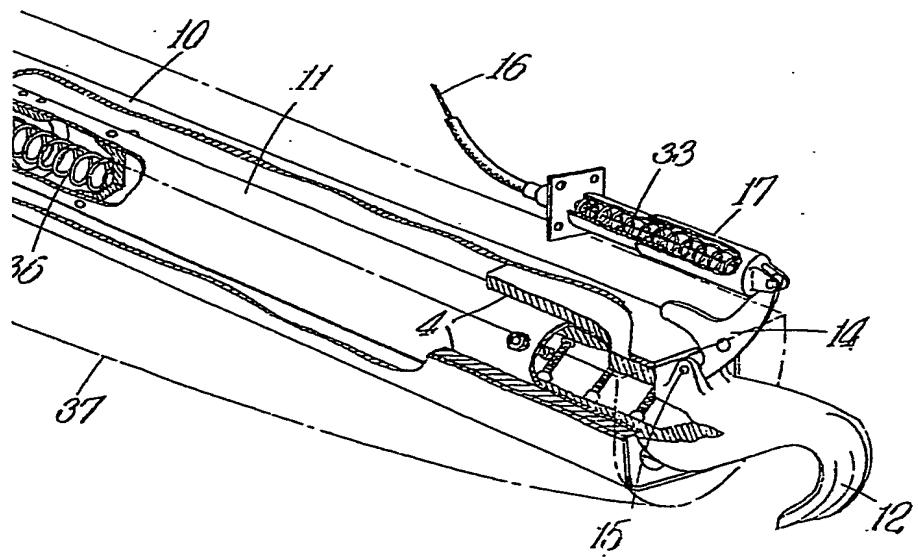
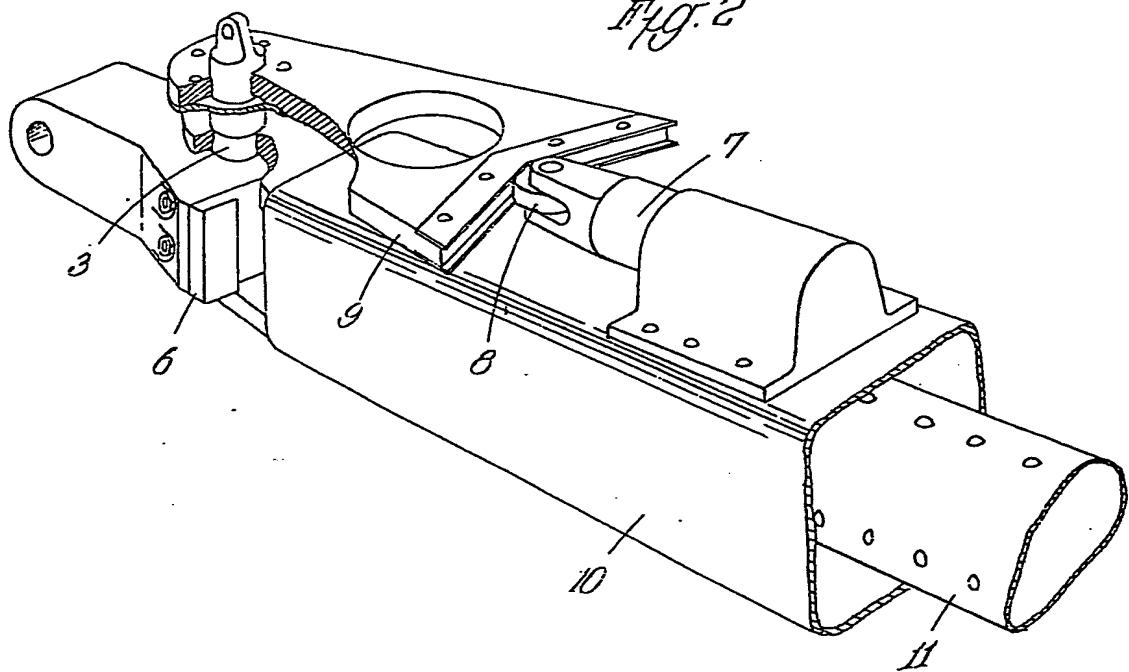
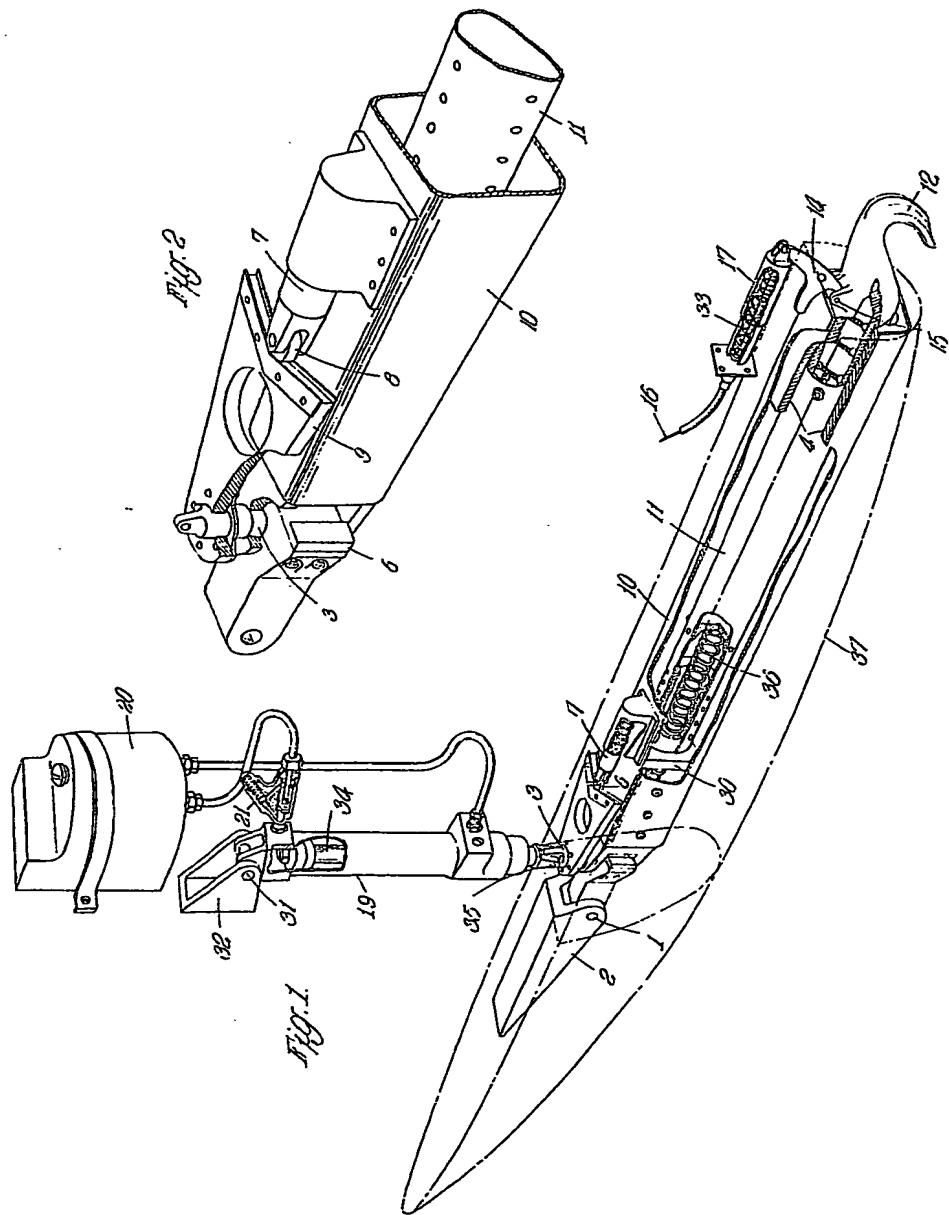


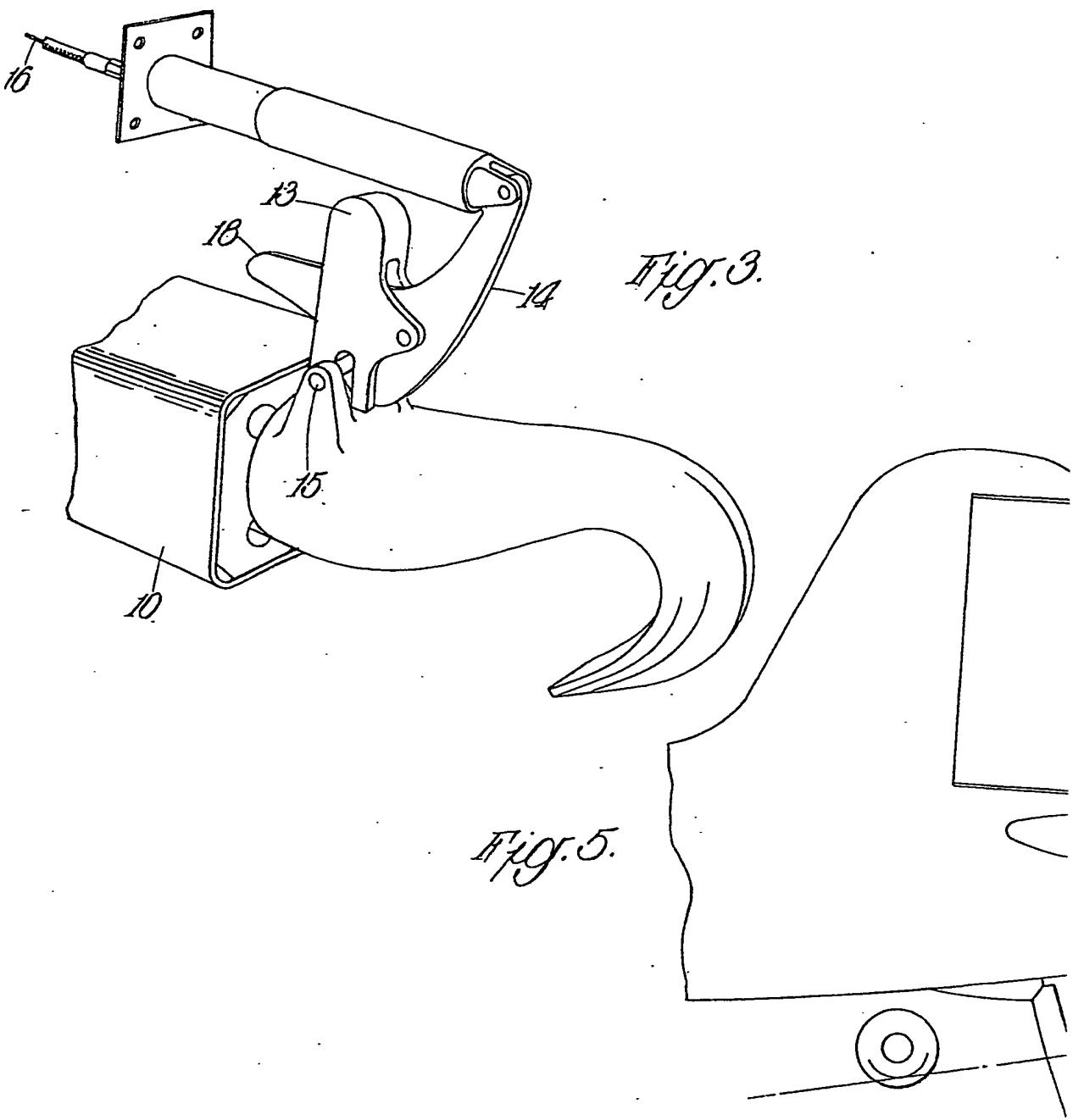
Fig. 2

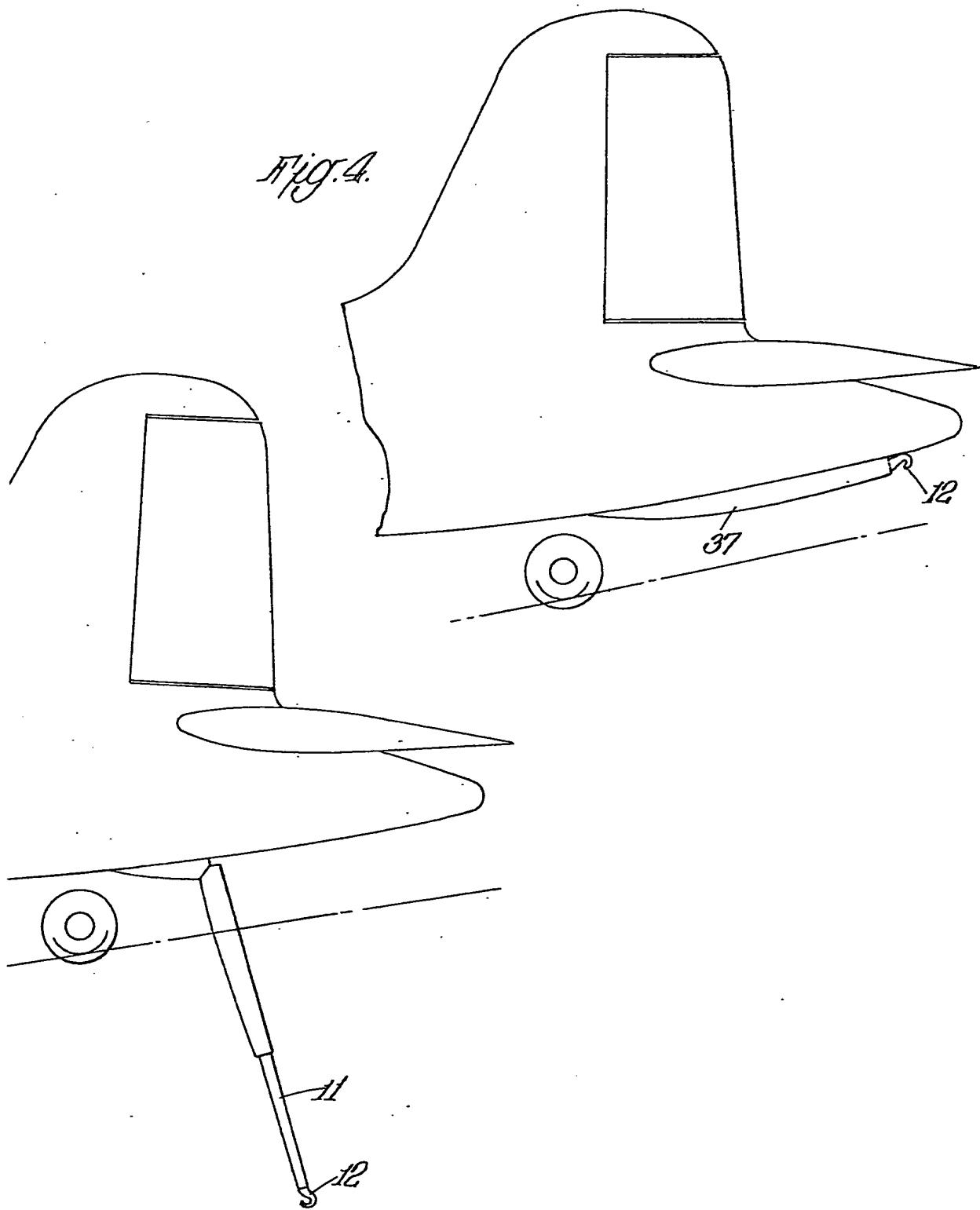


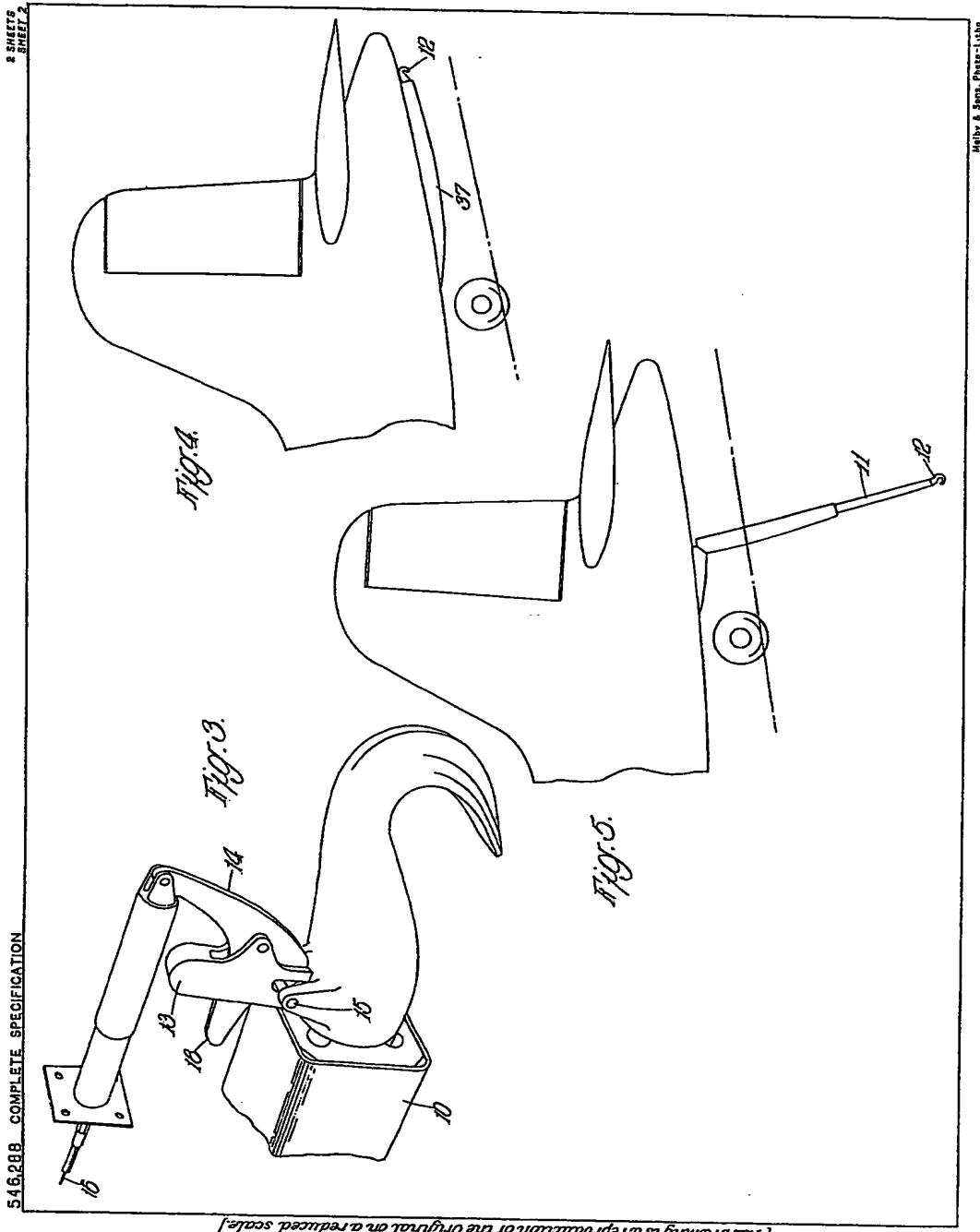


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